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William H. Mansfield III

The 1990s demand a redefinition of national security and the kinds of problems that pose a threat to it. The 1970s expanded national security concerns to include economics. The 1990s and the next century will further expand the definition to include environmental, natural resource and population issues. For the first time in history, humans are upsetting the very life support systems of the planet. The resultant changes will disrupt living conditions and economies and, consequently, provoke conflict. And if these changes are not arrested, or at least managed satisfactorily, they will have profound and probably irreversible consequences that will affect the security of nations.

One of the driving forces in international relations in the 1990s will be environmental change. We will need a new way of thinking about foreign relations and new tools to address the problems. We will need to recognize potential environmental conflicts at an early stage and shape action plans, legal structures and institutional mechanisms to prevent them from provoking international conflict.

There are already diplomatic skirmishes regarding transboundary air pollution and acid rain involving Mexico, the United States and Canada, and among a number of European and Scandinavian countries. Carbon dioxide build-up in the atmosphere is also a contentious issue, as evidenced in the UN Framework Convention on Climate Change. The build-up of this and other greenhouse gases may cause more serious dislocations as global warming is felt, rainfall patterns are disturbed, agriculture upset and populations uprooted by sea-level rise on low-lying coasts and islands.

Competition for scarce freshwater supplies is already a source of friction: along the Rivers Jordan and Litani; the Nile; the Tigres-Euphrates; the La Plata and Paraña in South America; and the Indus, the Ganges and the Mekong in Asia. Of 200 major river systems, more than 50 are shared by 3 to 10 nations. These major arteries support 40 percent of the world's population.

Similarly, environmental refugees, deforestation, land degradation, ocean fisheries, hazardous waste dumping, and chemical and nuclear accidents are all current sources of tension which are more likely to increase than disappear.

UNEP and its UN sister organizations have gained considerable experience in the past two decades in addressing the sources of these environmental conflicts, and are currently addressing all these problems. For example, the UN's Earthwatch Programme, coordinated by UNEP, monitors and assesses the state of the environment, particularly in relation to climate, transboundary pollution, renewable natural resources and oceans.

More than 120 countries participate in UNEP's 10 Regional Seas Programmes, covering most of the world's major shared seas. Each programme is tailored to the special needs of the participants, setting up a framework for the cooperative management of coastal zones, and a plan for research, monitoring, control of pollution and development of coastal marine resources.

We have initiated a similar programme for shared river basins, lakes and acquifers. We concluded an agreement in 1987 for the eight countries in the Zambezi River Basin and we are working with governments to conclude arrangements for the Lake Chad Basin, the Nile and Orinoco Rivers, and the Aral Sea.

These new and potentially dangerous and divisive international environmental hazards pose a challenge to the UN system. We have to be prepared to act now to prevent such conflicts arising in the future.

William H. Mansfield III
Special Representative of the Executive Director
and Former Deputy Executive Director
United Nations Environment Programme

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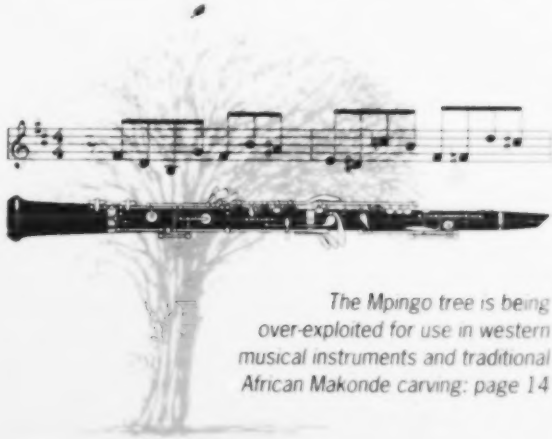

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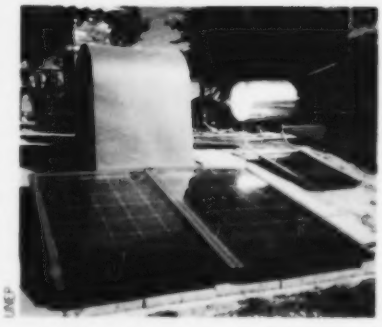

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HUNGER VERSUS THE ENVIRONMENT: A RECIPE FOR GLOBAL SUICIDE

Panos Pictures/FAO

by NABIL MEGALLI

The more humans there are to feed, the more we gnaw away at the the Earth's ability to feed us ...

Have you eaten enough today? One-fifth of the world population is not so lucky. Furthermore, the odds are that your children will suffer, one way or another, from the fall-out from the rabid race between global hunger, rampant environmental degradation, and population growth gone berserk.

The picture of hunger in the last decade of the 20th century is frightening. Already, one billion people do not have the minimum to eat, and there will be one billion more mouths to feed by the year 2000. Agriculture is devouring its own base in three continents that cover two-thirds of the world's area and house four-fifths of its population. The world is galloping towards a situation where it will not be able to feed itself, no matter what it does.

In the United States, farmers are suffering from droughts at a frequency unprecedented in modern history. Global warming has already led to three severely drought-reduced harvests in the United States during the 1980s, even though droughts have, as a rule, occurred there once every 20 years.

There is evidence that a plateau has been reached in global efforts to increase the area under cultivation and enhance yields per hectare through agrochemicals. This desperate squeezing of the land for more food is accelerating environmental degradation, which turns millions of hectares each year into wasteland. According to UNEP's Global Assessment of Soil Degradation (GLASOD), there were 4700 million hectares of agricultural land in 1988, but 1230 million hectares—that is, about 25 percent—suffered from some degree of human-induced degradation. In this hunger- and debt-driven hunt for food or profits, or both in the case of many small-scale developing world farmers, the search for new agricultural land is an irresistible cause of deforestation, overgrazing, overcropping and overfertilization. In turn, this causes desertification, salinization, pollution of water resources and erosion of valuable topsoil. It is often the cream of agricultural land which is lost, while the new land is inevitably less suitable and less productive, and so more rapidly degraded.

> *'Food security must be the first priority of sustainable development.'*
>
> Dr Mostafa Tolba,
> Executive Director, UNEP

Current global topsoil losses are estimated to be 24 billion tonnes annually. In the US Corn Belt, studies show that each inch of topsoil lost reduces crops by 6 percent. In West Africa, topsoil loss has already reduced land productivity by 50 percent. Red Cross studies indicate that Ethiopia, which has only 6 percent of its forest cover left, is bleeding its topsoil into rivers at the rate of 2000 tonnes per square kilometre per year. Globally, per capita food production is retreating on another front, as population growth continues to defy all demographic predictions and birth control campaigns. The world population currently stands at 5.5 billion and current estimates indicate it is likely to reach between 10.4 and 14 billion before it levels off.

The world fish catch, estimated at 91 million tonnes in 1986, has probably already exceeded the maximum sustainable yield of 100 million tonnes. From that point on, the fish catch can only go on a downward spiral. The UN Food and Agriculture Organization (FAO) says that overfishing and pollution have severely reduced the catch by small-scale fishermen, which is the main source of protein for their families and small local

J. Holmes/The Environmental Picture Library

Salinization ruins a great deal of prime agricultural land, and is often caused by waterlogging due to excessive irrigation.

communities in many parts of the world. A lower fish catch means lower livestock production, since up to 45 percent of the catch is used as animal feed.

Attempting to play down the effects of pollution and global warming is as futile as the belief that some regions can continue playing the role of global breadbaskets, at a high cost to themselves and to the rest of the world. It is estimated that the industrial giants in the 25-nation Organization for Economic Cooperation and Development (OECD) spend more than US$150 billion annually in direct and indirect agricultural subsidies to keep potentially low-cost farmers in the developing nations from entering the market. The result is agricultural ruin on both sides of the artificial North-South divide. Agricultural subsidies eat up to three-quarters of the European Community's budget, and the cost of storing and destroying surplus EC foods has been estimated at US$225 million per week. In the United States, the Comptroller General has reported that governmental water subsidies often surpass the value of crops produced in arid and semi-arid areas. In these regions, wasteful irrigation consumes up to 80 percent of valuable water resources.

According to UNEP's *The World Environment 1972–1992*, the estimated annual costs of combating desertification globally stand at between US$10 billion and US$22 billion, while economic losses due to desertification are about US$42 billion. The longer the delay in confronting this accelerating degradation, the more costly an exercise it becomes. In 1980, the estimated cost of a 20-year programme to combat desertification was US$90 billion. In 1990–91, the estimated cost of a 20-year programme had risen threefold to US$270 billion, because the area affected and the costs of land reclamation are increasing.

Desertification affects 3.6 billion hectares or 70 percent of the world's potentially productive drylands, that is, nearly 25 percent of the total land area of the world. These figures exclude naturally occurring hyper-arid deserts.

Overfishing and pollution has severely reduced the catch by small-scale fishermen, with serious consequences for the local community.

The implications are made worse by the industrialized countries' use of up to three-quarters of global agrochemical supply on their limited territory, in order to fuel their agricultural 'miracle'. Traces, albeit minute in some cases, of carcinogenic pesticides have turned up in all groundwater reservoirs tested in the United States. In Europe, which uses 50 times as much fertilizer as Africa, nitrate concentrations in some major rivers have been increasing at an annual rate of 0.15 milligrams per litre since 1960 and have in some cases already surpassed the World Health Organization's acceptable limit of 11.3 milligrams per litre. Thus, the agricultural earnings of the industrialized world are dished back in the form of mushrooming health care costs and a lower quality of life for every citizen.

Studies have shown that one-sixth of North America's inhabitants in the Great Lakes area are exposed to the highly toxic substance dioxin. Many

Fighting land degradation

The UN Conference on Environment and Development (UNCED) in Rio de Janeiro in June 1992 called for an international convention aimed at controlling desertification. As this issue went to press, the UN General Assembly was deciding how to begin drawing up this convention and what it would cover.

Desertification is the process of land degradation whereby productive land becomes degraded through overgrazing, overcropping, salinization and erosion by wind and water. Many of these processes also involve deforestation. Desertification does not refer to the expansion of existing naturally occurring deserts, except where the expansion is a result of one of these processes.

Desertification affects more than 100 countries, including not only the Sudan-Sahelian countries of Africa, but also Australia, the United States, some southern European nations and some of the territory of the former Soviet Union.

In 1977, at the United Nations Conference on Desertification, a Plan of Action to Combat Desertification (PACD) was adopted. Despite the limited success of PACD, many actions to combat land degradation have been undertaken by the UN system, governments and other organizations, and of course, by individuals. Trees have been planted as protective belts and as fuelwood sources, agroforestry (mixing farming and forestry) has become more widespread and large areas of shifting sands have been stabilized, particularly in China.

Protecting the planet's forests

Forests play a vital role in protecting soils, watersheds and climate stability. They are also a rich source of products—ranging from fruits, pharmaceuticals and latex to timber—and are home to a vast range of different plant and animal species. In the lead up to the UN Conference on Environment and Development in Rio de Janeiro in June 1992, UNEP brokered the drawing up of a convention to protect biological diversity. This was signed by 156 nations in Rio.

There are a wide variety of initiatives being taken to protect the planet's forests, from local programmes to national and international programmes, such as the listing of national parks and debt-for-nature swaps, whereby donors repay national debt. This latter mechanism allows the debtor nation to use its money to protect its environment rather than pay foreign banks.

UNEP has been involved in forest protection through its contribution to the agreement reached at UNCED. This was a statement of the principles for the conservation and sustainable development of all types of forests. It is a non-binding agreement which will be reviewed after three years to see if countries want a convention to conserve forests.

UNEP also contributed to Target 2000, drawn up by the International Tropical Timber Organization (ITTO). Target 2000 is a commitment by a country to have all timber traded within its borders sourced from sustainably grown forests by the year 2000. The agreement was endorsed at UNCED in Rio. Signatory nations present annual reports on their progress towards the target. The most recent meeting was held in Yokohama, Japan, in November 1992.

UNEP, together with the United Nations Development Programme (UNDP) and the World Bank, administers the Global Environment Facility (GEF), a three-year US$3 billion pilot programme aimed at funding programmes that deal with specified global environmental problems, such as the loss of biological diversity from rich habitats, including tropical forests. All funds under the pilot programme have now been spent, but as this issue went to press, a meeting was to be held in Côte d'Ivoire in December 1992 to consider the future direction and scope of GEF.

UNEP also has a number of specific programmes aiming to help protect forests. For example, UNEP has had a methodology devised to assess 'the environmental, social, and economic impacts of plantations'. Possible sites for evaluating the methodology are currently being considered. There are likely to be three sites, one in Africa, one in Asia and one in Latin America. UNEP is also focusing attention on the relationship of forests to environmental change, and a workshop on this subject is scheduled to be held at UNEP headquarters in Nairobi in December 1992.

water wells in the eastern United States have been abandoned because of toxicity levels. Excessive pumping of ground water for agriculture has caused subsidence. The ground in some areas of California's San Joaquin Valley is already 30 feet below its level 50 years ago. Such stratification is a factor not fully taken into consideration when assessing the flooding potential of global warming. This has particularly ominous implications for regions which rely almost exclusively on ground water supplies, such as some small island states and the coastal regions where, incidentally, 50 percent of the world's inhabitants live. The problem of sinking ground level is compounded by the extraction of other minerals, particularly petroleum deposits in coastal states. Meanwhile, water pollution is threatening expensive coastal water desalination and power plants in regions which have invested heavily in this field.

On the so-called Southern side of the planet, peasants, who form the majority of populations in many developing countries, have slipped from subsistence to near-starvation. Here, the status of the average farmer is the exact opposite of his counterpart in the North. Because of agricultural protection, farmers are effectively insulated from any beneficial price increases that may occur on the international agricultural bazaar. Governments keep prices artificially low to maintain 'social peace' in the overcrowded urban areas. The net result is a fall in returns to farmers, followed by a fall in food production, growing potential for civil strife and social decay in the countryside.

J. Holmes, The Environmental Picture Library

Some 47 percent of the world's population will be living in cities by the year 2000, and there will be megacities of up to 20 million inhabitants.

Some 47 percent of the world's population will be living in cities by the year 2000, in comparison with 10 percent in 1980 and 1 percent in 1940. There will be megacities of up to 20 million inhabitants (*see page 13*), and social friction and crime of unprecedented dimensions. About 90 percent of the projected population increase will take place in developing countries, and two-thirds of that increase will be in cities.

Mounting foreign debt payments also drive governments into encouraging export cash crops based on monocultures, at the expense of the vast genetic diversity of natural environments. More forest has to be axed, while, all too often, soils are driven to exhaustion by incessant cropping and reduced fallow periods. The result is that hunger feeds on itself in a vicious cycle of environmental degradation and expanding famines.

Bakstad/Panos Pictures

The deforestation in Somalia is devastatingly clear, as refugees cut the sparse vegetation for fuel.

Three-quarters of the inhabitants in Africa work in the agricultural sector, and the continent was a net exporter of food 20 years ago. Today, as Somalia's devastation all too clearly attests, Africa is the leading example of food insecurity in the world, not only because of warfare, but also because of massive deforestation. Around the growing number of refugee camps in Ethiopia, Somalia and Sudan, the deforestation is frighteningly clear, as the refugees cut the sparse vegetation for fuel.

By the year 2000, there are likely to be up to 130 million hungry people in the Sahel countries of Africa as a result of drought and desertification. Whereas Asia has the largest number of hungry people, Africa stands out in terms of the percentage of people affected—25 percent of the population. Africa has one-quarter of the international refugee community, even though it contains only one-tenth of world population. The World Bank warns that 'Africa's food situation is not only serious, it is deteriorating'.

Worldwide, per capita food production rose by one-third in the period 1950–84, but it has declined by 7 percent in the 1984–89 period and is expected to fall by another 7 percent by the year 2000. In Africa, per capita food production has plummeted 20 percent from its peak in 1967. Extrapolation of present trends by World Bank analysts yields a 'nightmare scenario' for the entire continent.

In Latin America, the same phenomenon has been in evidence since 1981. Brazil, which at the time had the ninth largest gross national product in the world, in 1987 approached the World Food Programme for emergency aid to feed 2.5 million peasants in its north-eastern region. They had swollen the state capital of Ceará Mirim by nearly one million during the mid-1980s. This is attributable in part to unprecedented drought and changing rain patterns linked to the surface temperatures of the El Niño currents in the Pacific. But equal blame falls on rapid deforestation, a fall of up to 75 percent in food crops matched by similar increases in export crops, and the contraction of the role of small farmers, while less than 8 percent of the population are garnering 80 percent of the land.

The downward agricultural spiral in developing countries has reversed only in cases where the average peasant has been allowed to add his input to the land he had jealously nurtured for millenia as his one and only source of sustainable livelihood. Cooperatives and non-governmental organizations play an indispensable part in this process. Improving the status of women and recognizing their key role in agricultural communities has been an important factor where agricultural output has increased.

Without improving the human side of the agricultural equation, there is little hope for added productivity through technical input or putting more area under cultivation. Response to fertilizers is levelling off after a 3 percent annual increase between 1950 and 1984 which boosted output 2.6 times. Meanwhile, there is a steady loss of irrigated areas, which provide one-third of the world's crops from only 18 percent of its agricultural territory. Irrigated areas grew from 232 million acres in 1950 to 615 million acres in 1980, but these areas are now being lost, largely because of increased salinity and a steady fall in the water table. According to UNEP's *The World Environment 1972–1992*, 43 million hectares of irrigated land (30 percent of all irrigated dryland) show evidence of degradation, mainly waterlogging and its resultant salinization and/or alkalinization. In the United States, groundwater levels beneath much of the irrigated land are falling between 0.15 metres and 1.3 metres a year, and even greater drops have been recorded in China. Any further increases in agricultural lands will be in marginal and high-cost areas, or through deforestation, which will add further to the ruin.

If humanity is to feed itself, this environmental degradation has to stop—and stop soon.

FAO

It is vital to improve the status of women and to recognize that wherever women play a key role in agriculture, output invariably increases.

Air pollution cuts food production

It is not just what happens on the ground that threatens food production. Substances such as chlorofluorocarbons and other halons destroy stratospheric ozone. For each 1 percent decrease in stratospheric ozone, there is a corresponding increase of about 2 percent in UV-B radiation and a 1 percent loss in key crops such as soya beans. Exposure to increased UV-B also reduces the effectiveness of the body's immune system, increasing the incidence of disease, eye cataracts and skin cancer. Meanwhile, studies in the United States indicate that air pollution has already reduced crops by 5 percent and that ozone at ground level, caused by the action of sunlight on smog from the burning of fossil fuels, is costing US agriculture US$5 billion annually in crop losses.

INTERVIEW

Dr Mostafa Tolba has been at the heart of UNEP since the organization's inception in 1972: as Executive Director since 1976, and as Deputy Executive Director before that.

In this interview with UNEP staff writer, Beatrice Lacoste, and Our Planet editor, Shane Cave, Dr Tolba reflects on the changes of the past two decades and the prospects for the future.

UNEP

'... we as human beings developed the misconception that we have the technological fix for every problem that is going to face us as a result of destroying nature. We are beginning to learn that that is not true—although nature is fragile, it still has the power to hit back at us ...'

LACOSTE *How do you see the future of the world environment?*

TOLBA I am an optimist. I think there is a new awareness of what I might call globalism.

Governments of the world are now seeing the globality of a number of environmental problems, such as climate change, ozone depletion, dumping of hazardous wastes, destruction of biological resources and of forests, and the impact of desertification; they are seeing this very clearly and they have already started working together. It is a very difficult situation to find a common course for action and, even when you find a common course, there are difficulties based on economic development, on debts and falling commodity prices.

To make countries ultimately agree to doing specific things together for the betterment of a major environmental situation has been, and will continue to be, a difficult exercise. But I think governments are now seeing clearly that it is a must to protect the environment if they want to survive, and it is a must in most cases to work together, for no one can do it on his own. It will take money, it will take time, it is not going to happen overnight, but I am optimistic.

LACOSTE *What has been irreversible so far?*

TOLBA The loss of genetic diversity mainly. When you lose a forest or even you lose a bacteria in the forest or a fungus through chemicals applied to the soil, that sort of loss is completely irreversible. Anything else can be corrected—air pollution can be minimized; ozone depletion can be minimized; the global warming can be avoided; water pollution can be controlled; desertification can be controlled; but the loss of the species and the forests is something that cannot come back again. Extinction, as they say, is forever.

LACOSTE *Does humanity have to change its attitude towards the environment, to develop a harmony with it that perhaps we have lost?*

TOLBA There are two components to man's relationship with nature; population growth and technology. We have now 5.5 billion people, and a large number of them are destroying natural resources and nature simply for survival, because they have no alternative.

And then, of course, there is the tremendous development in technology, which has made man feel that he is the super power over nature. So with that development in science and technology, we as human beings developed the misconception that we have the technological fix for every problem that is going to face us as a result of destroying nature. We are beginning to learn that that is not true, that although nature is fragile, it still has the power to hit back at us.

It will take time to control the impact of population and to understand that our current lifestyle is based on destructive technologies that must be curbed.

CAVE *How has the international environmental agenda evolved since the 1960s?*

TOLBA I think 1972, the year of the Stockholm Conference on the Human Environment, was important. But even before that there were awakenings.

Back in 1968–69, there was a clear link between air pollution and economic activities, but it was simplistic. People in the United Kingdom were not finding fish in the Thames, and the smogs of London and Los Angeles told people that something was going wrong with the environment in which they were living.

That is why there was a call for the Stockholm Conference. But the developing countries were quite reluctant to attend. They did not see London-type smoke in any of the developing countries' cities, and they underestimated the water pollution that comes from untreated sewage and so on. These things were not obvious to them at that time, so they were reluctant players in a conference like this.

When the whole issue of environmental protection expanded to cover natural resource management, then developing countries started to see that they have a stake somewhere in this issue. This was critical.

So 1972, saw the linking the human activities, of what we now call development, to the protection and management of natural resources.

In the mid-1970s, we managed in UNEP to make the UN stress the interrelationships between people, resources, environment and development—meaning numbers of people and actions by people, migration by people, over-consumption by people. And studies on these interactions went on quite a long time, and have spawned a whole array of on-the-ground programmes that are making our world a better place to live in.

One of our major roles has been to stress the interconnections between the various components of the environment. So, for example, you cannot deal with the air, without dealing with the soil, without dealing with the water. And that is where we are now. There is definitely a much better understanding of the interaction between environment and development.

CAVE *How will the shift in environmental thinking during the past 20 years differ from the evolution of the environment agenda during the next 20 years?*

TOLBA The next 20 years will certainly see more understanding, more science. I am afraid that the more we know about the environment from the scientific point of view, the more difficult decisions become, and this is what will be on the international agenda: what is the trade-off between various problems of the environment and how to deal with them.

We are already seeing examples of this today. The new scientific findings are saying that if ozone is reduced in the stratosphere, this has a cooling effect, offsetting global warming. The same applies to the particles of sulphur which are producing acid rain. We are saying that we have to control acid rain by controlling the emissions of sulphur, and sulphur dioxide. But particles of sulphur cut down on global warming. So, there may have to be a trade off between what we do with acid rain *vis-à-vis* global warming, and what we do with ozone depletion, which is very destructive, *vis-à-vis* global warming, which is also destructive to life on Earth. That is one issue that is going to harass the environmental agenda in the next years.

The second is that whatever science we know, there is always a gap in our knowledge. The concrete example is, again, global warming. We know there is presently going to be an increasing temperature of something like 3 °C during the next 100 years, but we do not know where the increase in temperature is going to take place: is it going to be 3 °C all over the globe or –2 °C in one part of the world and +7 °C in another part of the world?

CAVE *In the future, do you expect any shift in the balance between scientific questions and economic obstacles as a focus for UNEP and environmental organizations?*

TOLBA No. Science will continue to be the base, because you do not get to deal with any environmental problems unless you get the science right.

The most important issue is: 'what is enough?' Some hide behind the fact that we do not have all the scientific information. But you have to get the scientific facts that force action. There will always be uncertainties. But that is no reason for inaction. On the contrary, it is a reason for precautionary action.

What is going to loom very, very strongly is what is the cost of dealing with the environmental problems. Unfortunately, current economic theories—neo-classical economics—completely underestimate the price of natural resources, and the result is that there is a completely skewed presentation of the wealth that is accumulating in a country, at the expense of the loss of that wealth in terms of lost natural resources.

The most famous example, that I am always quoting, is that neo-classical economics does not give a price tag to the tree when it is standing in the forest. It gives the price tag only when you destroy the tree, and sell it as a log of wood. It does not give a price tag to the fish when it is in the coastal area, it gives it only when you harvest the fish and have it on the market—then you have a price tag. What is the role of the fish in keeping the marine ecosystem surviving and reproducing all the time—more fish and more shrimps, and so on? There is no way that current economic theory is taking this into consideration.

The cost of pollution or pollution control is normally externalized. It is not normally set on the balance sheet of the companies. These are the changes in the economics which will force themselves on us because of international environmental treaties.

Or consider biodiversity. Look at the tropical forests, which are very rich in genetic resources that are of use to humanity. They are being dismembered at alarming rates. So, we see that this 2000 hectares are to be preserved because they are very rich in resources. Fine, how are you going to force Brazil or Colombia or any other country to protect this? It is each country's right to use what God, nature, gave it to feed its people. If it is for the good of humanity to preserve this land, then humanity should give compensation for this.

What is the compensation, what is the price of one hectare of forest? Is it the price of a log of wood that you cut out of it, or is it the price of the unknown genetic resources? That is the most difficult question. We have one plant taken away from Madagascar—the rosy periwinkle—which has produced a medicine against childhood leukaemia. Now, instead of a child with leukaemia having one chance in five to live, he now has four in five to live, because of the rosy periwinkle from Madagascar. How do you know that 100 plants here in Kenya are not going to be of the same use for AIDS, for cancer, for things which are going to be discovered later on—types of diseases? How do you put a price tag on that unknown issue? How do you put a price tag on the role of the forest as watershed, protecting rain from being dried out or protecting the soil from being thrown away? How do you set the price tag for trees being a shelter for the human beings living in the forest, and so on? But this question is going to force itself upon the economists, whether they like it or not.

CAVE *What are the implications for UNEP of the growing importance of environmental economics?*

TOLBA Well, one of our main divisions is now dealing with policy development in what we call natural resources accounting, and environment and economics. I hope a very strong emphasis on these two issues will go to the Governing Council next year.

UNEP will take a lead, and I am very, very proud and very happy about this. The UNCED meeting Rio stated that UNEP has to take the lead in that very complex and difficult issue of natural resource accounting and environmental economics.

I do not think that this matter is going to be resolved in less than the next 10 years, so it should have a programme such as the one we have for environmental law. We have, with a series of other organizations, a 10-year programme for environmental law developed by experts from governments all over the world. I think we need a similar programme on environmental economics and natural resource economics.

With environmental economics, we have to work together with the World Bank, we have to get together with UNCTAD and with GATT, because of the links between trade and the environment.

Governing Council, either a Special Session in 1994 or the Governing Council in 1995. But there must be a 10-year programme for environment and economics, covering natural resource accounting and costing. So that is going to be one of the essential priorities in UNEP.

And we should ask for people who are very highly qualified. But this does not mean that UNEP should turn itself into a research institution. We need, in the area of environmental economics, two or three very very good economists, including a natural resource economist. They alone are not going to solve the issue, but they are going to prepare, for example, what I call 'issues papers', questions that need to be addressed by top notch economists from all over the globe. Groups of experts of 15, 20 people.

But, unless we have, in this organization, a core team of people who can prepare the brief paper of issues that need to be addressed, these top notch people are not going to come to us.

CAVE *What will UNEP need to be effective in the area of early warning of environmental disaster?*

TOLBA What applies to environmental economics applies to early warning of environmental emergencies. You have to have units which work effectively with all the relevant United Nations organizations. But we need the human resources to do this.

So the basic question is: 'Is UNEP going to be supported financially?' This is what Rio was all about. A commitment was made at Rio, and adopted by 110 heads of state. But for UNEP to carry all the 14 additional elements that came from Rio, and continue to be the principal organ for environment in the United Nations, it needs much better access to financial resources and human resources. Otherwise all the fine words that came out of Rio will be just that—words.

That is what they said and it remains to be seen how far this is going to be translated into something concrete.

CAVE *How soon will it be before any substantive unit on the environment and economics exists within UNEP?*

TOLBA We have been working on various elements of this with the World

Bank for quite some time. We came up with what is called 'parallel accounting'—fiscal accounting involving economic growth and natural resource accounting going parallel to it. But we have not managed, neither we nor the World Bank, to come up with an integrated accounting system that would take natural resources into the fiscal system of the national account system. We are now trying to develop this.

The number one specific issue that we are concentrating on is what sort of price tag we are going to put on each natural resource and that. There are probably things that can not be accounted for in dollars and cents, but can at least be described and have a comparative description of what is happening. The second element we are going to concentrate on is not only the course of action to correct environmental damage such as ozone depletion, climate change, biodiversity loss, but what is the cost of inaction? Over what period of time?

The difficulty is that environmentalists are talking of the long term, economists are talking of short term profit, the quarterly balance sheet of a company, or the next elections for the government, where they have to show economic movements. But environmental destruction is a long term exercise and the reward from protecting this is coming in 10, 15, 20 years. How are we going to reconcile this with the economic point of view? My thinking now is to invite a small group of the highest level of the natural resource economists and classical economists, with probably a limited number of biologists or ecologists, to be a senior advisory panel to UNEP on the issue of environment and economics. And that could probably expand into other economic issues such as the problem of debt relief and its impact on the environment and vice versa, and trade, commodities, economic incentives and all those kinds of issues would be part of a much larger programme.

CAVE *You have talked in the past about the ineffectiveness of international environmental treaties. What will it take to make conventions effective?*

TOLBA One, as many countries as possible must become parties to conventions and treaties. At present, we do not have many treaties that have more than 100 parties; probably the only one is Convention on International Trade in Endangered Species of Wild Fauna and Flaura (CITES), although the Vienna and Montreal treaties on ozone probably come close to this. But many other important treaties are much less well supported.

Two, compliance with the requirements of the treaty implement what all the governments have negotiated. When it comes to environmental destruction and degradation, global warming and ozone depletion—things which can wipe out life on Earth—this is as bad as a nuclear explosion or an atomic bomb. Why did the superpowers, at the time of being so hostile to one another, agree on a treaty to end the arms race and to have on-site verification, but not do the same with issues such as CFC production, which can do exactly the same harm as an atomic bomb?

My third point is that the contracting parts of each treaty should seriously consider elected committees to verify that they are actually doing what they say they are doing. This verification can be by rotation, so that everybody feels comfortable that nobody is investigating them.

And then we come to the next issue: flexibility. The treaties we have now are based on the science that we have today. We have to adjust treaties in line with the findings of monitoring the impact on the issue for which the treaty was designed. For example, in 10 years' time we will have to see if there is any healing of the ozone layer. The legal instruments have to develop as our scientific knowledge develops.

CAVE *You talk about verification. Does that mean that you expect that international organizations, particularly parts of the United Nations, would perhaps be more involved in matters which in the past were regarded as domestic matters within national boundaries?*

TOLBA That is the whole issue of sovereignty, that what you do within your borders is your own problem, what I do within my borders is my business. The issue of sovereignty has started to erode in the international community. Human rights, racism in South Africa, human rights abuses in the former Soviet Union, these were not left by the international community to be internal problems, they were put on the agenda of the international community for years.

So, the whole issue of sovereignty is fading a bit. What is happening with the environment now is exactly the same.If the United States and others are going to continue to produce carbon dioxide, that would lead to a sea level rise which would drown 5 million of my people in Egypt. They are not going to sit back and allow the United States and others to do that to them.

So the fact is that there is a relaxation of the issue of sovereignty in that context. It has been with us for the past 20 years or so, and it is moving in this direction. In fact, when I was a student of Imperial College of London, immediately after the war, there was a coin, 'the half sovereign', and I am saying that what we are seeing now are half sovereignties.

NEW COORDINATOR FOR MIGRATORY SPECIES CONVENTION

UNEP

Mr Arnulf Müller-Helmbrecht is the new coordinator of the Bonn-based Secretariat of the Convention for the Conservation of Migratory Species (CMS).

Mr Müller-Helmbrecht, 50, was formerly a civil servant in the German government, and since 1976 he has been active in nature conservation. This has involved him in negotiations on national and European legislation, and in the implementation of regulations for the protection of endangered species. His recent responsibilities have been in the establishment of a legal system for the conservation of about five percent of the area of Eastern Germany.

Mr Müller-Helmbrecht is optimistic about translating the Bonn convention on migratory species into action. 'I believe that prospects for progress are very good at the moment because public awareness of global environmental problems has been aroused by the UNCED conference in Rio de Janeiro, and because some of the issues dealt with there, as well as the new Convention on Biological Diversity, are closely related to CMS.'

Mr Müller-Helmbrecht's priorities are to increase the number of nations that are party to the convention, and to initiate regional agreements for the conservation of migratory species on all continents.

NORWEGIAN SUPPORT FOR EMERGENCY CENTRE

Norway has agreed to provide stand-by equipment and staff to be available within 24 hours for use in environmental emergencies. The Norwegian contribution reinforces the Geneva-based UN Centre for Urgent Environmental Assistance, established by UNEP at the beginning of 1992. The centre acts upon request in an environmental emergency, and the Norwegian support provides for the immediate availability of experts and equipment. Initially, the equipment will be for the monitoring of air and water quality, and seconded staff will be people who are skilled and experienced in operating the equipment.

The centre was established against a background of man-made environmental disasters, such as Seveso (Italy), Bhopal (India), Chernobyl (Ukraine), the *Exxon Valdez* oil spill (Alaska), the oil damage of the Kuwait-Iraq war, and an increasing number of small-scale and localized environmental accidents.

Norway already has a system of emergency preparedness to get relief items rapidly to disaster areas. The equipment and supplies can be air-borne within 24 hours. Some of the material is stored in disaster-prone areas of Africa, as well as in Norway. Norway will cover the administrative costs of the system and the costs of transport to and from the emergency.

The UN centre is not just involved in the provision of people and equipment. One of its most important roles during its 18-month experimental phase will be the drawing up of a draft 'UN Environmental Emergency Plan', setting out the process of decision making. This plan will identify the precise role of participants in the UN system in case of an emergency.

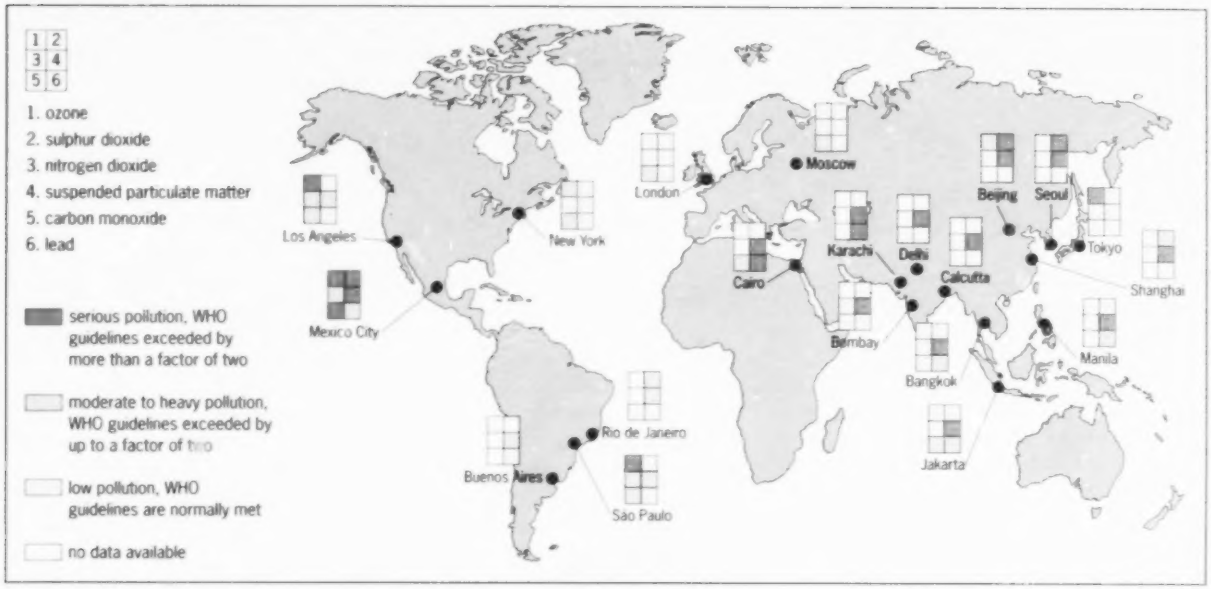
Currently, the only UN agencies which focus specifically on responding to the environmental consequences of man-made disasters are the International Maritime Organization (IMO) and the International Atomic Energy Agency (IAEA).

UNEP ENVIRONMENTAL TECHNOLOGY CENTRE IN JAPAN

UNEP and the government of Japan have jointly established a centre to promote the transfer of environmentally sound technologies to developing countries. It will also contribute to those countries of Eastern Europe whose economies are in transition. The centre will be in the city of Osaka, and will be funded by government and non-governmental bodies' contributions to a technical cooperation trust fund. The government of Japan has so far contributed US$2 300 000 for 1992–93 to this fund.

The centre will be manned by six UNEP professional staff, and will provide training and consulting services, carry out research, and accumulate and disseminate related information. Its activities will initially focus on the environmentally sustainable management of big cities and the management of freshwater lakes and reservoirs and their basins.

MEGACITIES' AIR QUALITY WORSENING



Words and Publications

A UNEP/WHO (World Health Organization) report on air pollution in 20 of the world's megacities points to a massive deterioration in air quality in the booming developing world megacities (*see box for list of cities*). In some cases, the air pollution is as bad as the infamous London smogs of 40 years ago, the report concludes. But, whereas London, Los Angeles, New York and Tokyo have made dramatic reductions in air pollution during the past four decades, population explosions in cities such as Bangkok, Beijing, Cairo, Mexico City and São Paulo have posed serious threats to the millions of people who live in them, from premature death and serious long-term disabilities.

The study investigated six major pollutants: sulphur dioxide, mainly from emissions from oil burnt in power generation and industrial plants; suspended particulate matter, largely from domestic fires, power and industrial plants; lead, carbon monoxide and nitrogen dioxide, all chiefly from the petrol fumes of cars; and ozone, formed by the action of sunlight on the smog from vehicle emissions.

Mexico City emerges as the worst affected, although the report does cite signs of improvements as controls on the causes of the pollution begin to be imposed. But the city still exceeds WHO guidelines by more than a factor of two for levels of sulphur dioxide, suspended particulate matter, carbon monoxide and ozone. Lead and nitrogen dioxide levels are nearly as bad, exceeding WHO limits by up to two times.

The future looks even worse for many of the cities, however, for unlike the newly industrialized countries such as Mexico, there is little awareness of the severity of the problem and of its projected rapid deterioration in the near future. Few moves have been taken to control the problem in these megacities, the report warns. The authors point out that the same applies in a number of other, only slightly smaller, cities not covered by the report. These cities face slow suffocation as their air condition continues to worsen.

Most of the pollutants directly affect the respiratory and cardiovascular systems, and lead causes damage to bone marrow, liver and kidneys and permanent neurological damage, especially in young children. Carbon monoxide can cause both neurological and cardiovascular damage.

Motor vehicles are the single largest cause of this pollution in all the cities, and overwhelmingly so in some. This is still the case in the developed country megacities of London, Los Angeles, New York and Tokyo, and in Bangkok, Jakarta, Manila, Mexico City, São Paulo, and Seoul. The present total of vehicles in the world, 630 million, is expected to double within the next 20–30 years, mostly in urban areas.

And things can be expected to deteriorate in many of the world's fast-growing cities. In 1970, there were only four cities with more than 10 million people; by the year 2000 there will be 24. While there were 35 cities in 1970 with populations of more than 3 million, there will be 85 by the end of the century, by which time 47 percent of the global population will be living in urban areas.

Action to control air pollution must be a high priority, and must include energy conservation, motor vehicle restrictions, the phasing out of leaded petrol and the promotion of mass transit systems.

The data for the report were collected by UNEP's Global Environment Monitoring System and WHO during a 15-year period.

The 20 megacities in the report

Bangkok, Beijing, Bombay, Buenos Aires, Cairo, Calcutta, Delhi, Jakarta, Karachi, London, Los Angeles, Manila, Mexico City, Moscow, New York, Rio de Janeiro, São Paulo, Seoul, Shanghai and Tokyo.

SAVING THE TREE THAT MAKES MUSIC

by DAVID LAZARUS

In a Paul McCartney song, a line reads: 'Ebony and Ivory, together we work in harmony.' There is, sadly, a discordant note where musical instruments are concerned. While attempts are being made to protect the elephant from ivory hunters, the ebony tree is left vulnerable to the ravages of nature and man.

Music and nature are inextricably linked. Wood instruments come from the best trees; natural guts are used for strings and hides for drums. The oboe, clarinet, basoon and the bagpipe depend on African blackwood or Mpingo for their pure sound. Synthetic material instead of ivory is being used for piano keys. However, there is no substitute for certain types of hardwood, especially the Mpingo, for purists and fans of good music. 'No self-respecting musician would use plastic,' says Briton Robert Lamb, one of the journalists leading a crusade to save the Mpingo tree.

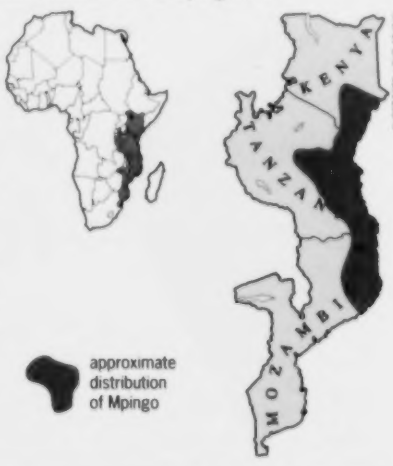
In their search for the perfect sound, manufacturers, professional orchestras and jazz ensembles in Europe, America and Japan pay handsomely for this resource, encouraging people in cash-strapped countries to chop down trees for precious cash.

Just how serious is this depletion? The Mpingo resources are still unknown, especially in Mozambique where there has been a civil war. However, Tanzanian authorities do confirm that high-quality trees are indeed diminishing, reports Finnish researcher Maarit Puhakka in a 1991 paper. The present situation is alarming, she adds, and pleads for urgent action.

The thorny yellow plant, which rarely tops 30 feet on maturity, looks like most other trees in the African savannah. In fact, you wouldn't give it a second glance. Chop it, though, and the wood reveals its black treasure.

Tourists who have visited the East African states of Tanzania and Kenya would inevitably have come across Makonde carving for sale on every street corner. This is the other use for the curious tree. Another unique phenomenon is that the trees take 70–100 years to reach harvestable maturity, rendering plantation forestry or intensive management uneconomic, says

Distribution of the Mpingo tree



Brian McDermand, BBC

The Mpingo looks like most other trees in the African savannah—but its black treasure is hidden beneath the bark.

As well as being used for western musical instruments, the wood from the Mpingo is used to make beautiful carvings, common in Kenya and Tanzania.

UNEP

UNEP's officer in charge of forestry, Bai-Max Taal. 'Sound management practices, however, can help preserve the tree in the longer term, as well as better marketing of the Makonde products.'

The other danger to the Mpingo is fire. During East Africa's long dry season, much of the area is swept by fierce bush fires. Mpingo trees are damaged by the fires, but not destroyed. The damage is enough to render them unsuitable for use by the instrument trade. Proper management can help control the fires through 'controlled burning' operations.

Careful supervision by trained forest managers can also protect seedlings and nurseries. Although the Mpingo tree is revered by Tanzania—it is a national emblem—and protected by law, there is a lot of illegal felling. The trees are even smuggled out of the country and, worse still, sometimes used as fuel and cattle fences.

A practical management plan is what is needed, but it will cost money. UNEP, with the help of the Finnish Government in the latter half of the 1980s, investigated the situation and recommended an integrated management plan for the Mpingo in Tanzania. In order to finance it, assistance from the entertainment industry was planned. A concert to raise funds is an ideal way to publicize an environmental problem as well as raise money. Eminent musicians and their unions have expressed interest. 'To give the project a boost, a film has been made and we hope that this will raise people's consciousness,' said Taal.

Future plans to save the Mpingo include a new booklet, identification of nurseries, a concert and training for forestry managers.

'Prevention of environmental and natural resource problems well ahead of the crisis inevitably makes better sense than attempting drastic and expensive therapy when it's probably already too late,' warns UNEP's Executive Director, Dr Mostafa Tolba.

Boosey & Hawkes Musical Instruments, Ltd., UK

Don't stop the music

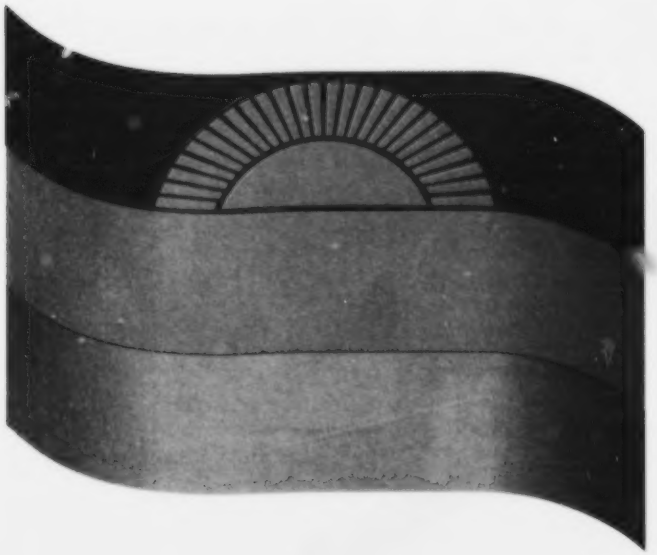
The honey-toned tune comes flowing out of a wooden clarinet. The piece is *Strangers on the Shore*, and the musician, Acker Bilk, world famous clarinettist. The peace is shattered by a clarinet bursting into a thousand pieces on a lathe.

These are just two strong images from the watchable 52-minute Sir David Attenborough film *Mpingo—the Tree That Makes Music*, released this year by the Television Trust for the Environment (TVE). The film was sponsored, in part, by UNEP, within the framework of the African Ministerial Conference on the Environment (AMCEN), an African programme for sustainable development. Directed by Mike Gunton, a veteran of many environmental films, it gives an excellent picture of what is happening to the Mpingo.

It was at the venerable Buffet Crampon factory in France, where skilled craftsmen turn ebony into clarinets and flutes, that the first signs of a shortage of good Mpingo stock was discovered. As more and more clarinets cracked under pressure, the cause of the trouble was traced to Tanzania, where good durable Mpingo wood is becoming scarce.

Seeing is believing, but hearing the music in this case is important too. There are plenty of musical interludes, with world class musicians—enough to convince the world not to stop the music.

One immediate result of the film is that UNEP will provide a small donation to a Tanzanian forester, who appeared in the film. He is virtually waging a one-man crusade to save the Mpingo. 'We hope others will be encouraged to do so, too,' said Bai-Max Taal, UNEP's officer in charge of forestry.



SOLAR BIZZ IN MALAWI

by JENNIE SWANN

The economies and efficiency of First World manufacturing can all too easily condemn developing countries to dependence on imported goods. This has put new clean technologies out of reach of developing countries, forcing them to use old, inefficient, polluting and unsustainable technology. But, as Jennie Swann reports, a Malawi company has found it can deliver mass-produced, environmentally sound and efficient water heaters at competitive prices.

A modern, automated metal-rolling mill, a machine which is comparatively commonplace in industrialized countries, can produce corrugated roof sheeting at 80 kilometres per hour. At this rate of output, it can meet the annual requirement of a small African country such as Malawi in just two days. An indigenous industry could not hope to compete with this sophistication in terms of either economics or technology. It is inevitably cheaper to import corrugated iron than to attempt to produce it locally. This applies not just to corrugated iron but to a wide range of other goods needed by developing countries. This impasse of conventional wisdom is faced by many developing nations and a way must be found to circumvent it. Perhaps a little lateral thinking would help.

Lateral thinking is fundamental to the design, production and trading philosophies of a small enterprise in Malawi called Eco Systems Ltd. It started in a back garden, about 15 years ago, as a hobby interest of the company's founder, J. J. J. Sonke. He set out to use the country's natural resources to the full, to reduce its dependence on fuel wood, imported fuels and, indeed, imports in general. These natural resources have been described as Earth, water, sun and people. They do not look very promising compared with those of many other countries, yet they are the stuff of Eco Systems' operation.

Mr Sonke began to apply these ideas to practise solar water heating. The use of solar energy in Malawi goes back to the 1950s. But, faced with competition from easily available firewood and high import costs to land-locked Malawi, there were few sales of the poor-performing imported solar water heaters. There was a need for a simple, locally-made heater suited to local water, climate and raw materials.

Models were developed in the late 1970s, and the company started production in 1984 with just five employees, initially supplying mostly rural mission stations. Today, the manufacturing process for solar water heaters is well established and the company now reckons to offer the widest range of specialized solar water heaters in the world. Capacities range from 75 litres to more than 5000 litres, and models have been adapted for different roof types, water supplies and architectural requirements. Their six square metre single-pass collectors, which can work in banks of more than 10 units to supply a single tank, are unique.

The operational principle of conventional solar water heaters is well established. Most of them make use of the thermosyphon effect in a closed circuit, which is heated on one side. The single pass heater is a new idea. It makes use of a thermostatic valve and

mains water pressure. It is more sophisticated, but it has the advantage of higher early morning temperatures. Solar water heaters of this type can also be built to a very large scale, without the need for a circulation pump.

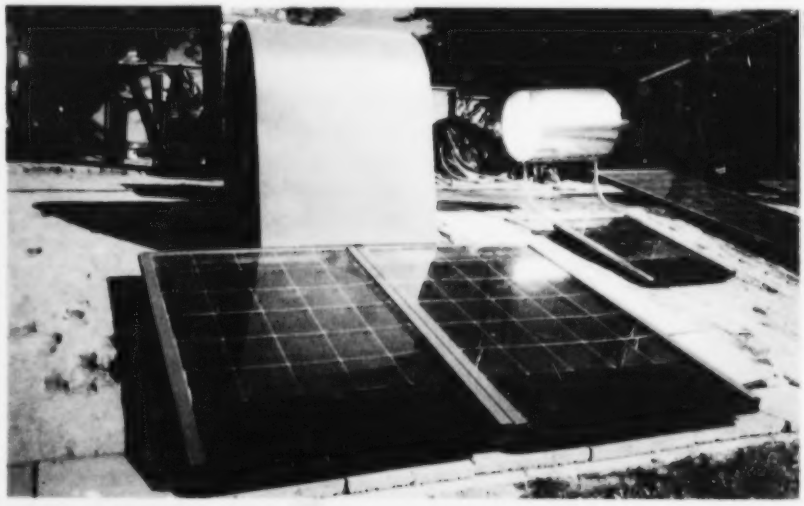
The design of these water heaters has been shaped by:

- ready availability of cheap labour;
- difficulty in obtaining materials and parts;
- locally available materials;
- local water and water supply conditions;
- local building traditions; and
- local climatic conditions.

They are made to different specifications to developed world equivalents, but few Central African countries suffer from frost, polluted air or acid rain. Nor do they normally have high minimum water pressures. The most important criteria, then, must be cost and performance. This equipment is relatively cheap, and it works well. In fact, one of the first models to be built went into operation in 1979 and is still working. Having no moving parts, these heaters are virtually maintenance-free. They perform almost as well in the cool season as in the hot one and, of course, the energy source—sunshine—is free.

In 1985, the Malawi government became the company's biggest customer—solar-powered water heaters have been supplied to a variety of government institutions, including about 10 rural hospitals. To date, some 950 heaters have been produced and installed in hospitals, schools, health centres, missions and private homes all over Malawi. A further 60 have been exported to other Central African countries. Production is now running at 20 units per month.

The company is expanding. Its workforce now numbers more than 100, and it has set up a daughter company, Ecoelectric Ltd. Working with a borehole drilling company, they can now provide a complete solar-powered water supply system with bore hole, water pump, piping, plumbing and storage tank. Solar-powered versions of centrifugal, piston and spindle water pumps have been developed, and some 20 have been installed in Malawi, and 5 in Zambia. Again, they are virtually maintenance-free.



Solar-powered water heaters are supplied to government institutions, such as hospitals and schools, and to private homes all over Malawi. Some 60 have been exported, and production is running at about 20 units per month.

Faced with high costs for metal—much of which, of course, result from the energy used in smelting—the company has used good design to minimize the metal needed in the tanks. They developed a polyhedral shape, in order to distribute the stresses evenly on the metal shell, so that much thinner gauge metal can be used in construction, further reducing raw material import costs. Of course, the more complicated design requires more skilled labour and such a tank takes considerably longer to make than a conventional one.

Nevertheless, the company can make a stainless steel tank for the same cost as a conventional galvanized one of the same capacity, and it lasts longer. A prototype for a 120 000-litre tank applies this principle with enormous

Eco Systems' daughter company, EcoElectric Ltd, manufactures water towers and water tanks, using an innovative polyhedral shape which allows a thinner metal to be used, reducing thus further the raw material import costs.

saving. A conventional rectangular tank of this capacity would need to be constructed of 10-mm metal sheet in order to resist bending. The new design could safely be made out of 2-mm sheet. However, the designers, aware of the psychological effects of such an unconventional design, are going to use 3-mm gauge to provide greater reassurance for potential customers.

A wide range of solar-powered lights is produced using small transverters to change the 12 volts direct current supplied by the solar panels to 220 volts alternating current. At present, these transverters are imported, but the company has plans to manufacture its own. Another area for development is that of refrigerators. A standard domestic refrigerator can be run on solar power by using a larger transverter. High ambient temperatures and irregular electricity supplies mean that these solar refrigerators work much better if they have slightly thicker insulation than is standard. The company is now adapting and installing solar-powered refrigerators for domestic use and its solar-power generating equipment is now good enough to run medical refrigerators.

A World Health Organization approved medical refrigerator must be able to maintain a sufficiently low temperature for 48 hours without power to preserve vaccines and other medicines. The company has now provided some 50 such solar-powered medical refrigerators to rural hospitals and health centres in Zambia, and about 15 in Malawi.

Recently, the company supplied a complete system of water pumping, plumbing, storage, heating, lighting and refrigeration to the health centre at Lisungu refugee camp. Water pumping systems have also been installed at the government health centre in Phalombe and for the isolated community of Likoma Island.

All the company's products can be made with hand tools. A few small machines are currently used in the factory in order to speed up production to meet ever-increasing demand. However, this type of production operation could be carried out in rural areas in this and other countries.

A labour-intensive approach can never compete with the developed world's highly sophisticated technology- and capital-intensive manufacturing methods. But expensive high-tech industries do not provide jobs, and they put economically and environmentally sustainable manufacturing beyond the reach of countries such as Malawi. Supply of the company's products to schools, hospitals, health centres and missions helps to develop the infrastructure that is essential for development. Environmentally sustainable energy sources, especially those with low maintenance costs and demands, will become increasingly popular as aid projects, because aid agencies find it easier to provide capital than ongoing finance for running costs and maintenance.

The future looks promising for this 'green' enterprise. Demand for its products in Malawi and Zambia is outstripping supply, and its ideas are finding favour in Zimbabwe and Mozambique. So far, the greatest obstacles faced by the business have not been economic or technological, but conventional thinking and red tape. Innovation carries risks, always problematic in the developing world, but especially problematic when the world economy is riven with recession. Yet it was risk-taking that catalysed the Renaissance and the Industrial Revolution in what is now referred to as the developed world.

Fortunately for this enterprise, there are few rules and regulations in the bush. Its motto is: 'Go and do it.' If it works, this will be its own best advertisement.

PUBLICATIONS

SURVEILLANCE OF DRINKING WATER QUALITY IN RURAL AREAS
Barry Lloyd and Richard Helmer,
Longman, Harlow, United Kingdom (on behalf of the World Health Organization and UNEP), 1991.

This book is a mixture of practical instructions on how to measure water quality and a detailed recording of the application of the system in three developing countries—Indonesia, Peru and Zambia. Born out of the UN's clean water decade of the 1980s, the project on which the book is based was a joint venture between UNEP and WHO. The authors point out that the success of water quality monitoring programmes in rural areas is entirely dependent on the training and motivation of the people doing the work. In the three countries studied, poor career prospects of the people actually doing the work was a major factor in the success of such schemes. In this project, the staff in all three countries were supplied with water testing kits and given specialized training in their use and in the purpose of their role. The water monitoring focused on bacteriological contamination using faecal indicators. After two years, the project could be used to identify the degree of risk associated with particular sources of contamination around the water source.

The book contains a description of the methodology used in the the programme and diagrams of how to use the testing kits supplied with it.

BIOLOGY OF FRESHWATER POLLUTION
(2nd edition), C. F. Mason, Longman, Harlow, United Kingdom, 1991.

Mason strikes a much more adversarial tone in this book, an update of a 1981 edition. The book contains enough scientific substance to background the processes at work in freshwater pollution, gives an overview of new problems which have been identified throughout the 1980s—acidification and radioactive contamination—and gives a rather depressing litany of new examples of old problems such as eutrophication and oil pollution.

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VIDEO

Highway to the Hidden Valley
Produced by TVE, 1992,
53 minutes, English

The Karakoram Highway runs from the Pakistani capital of Islamabad, along the Indus river, through the mountains of northern Pakistan, to China. Until 10 years ago, the people who live in the regions around the valley were cut off from the outside world. The opening of the road has changed their lives forever.

Highway to the Hidden Valley looks at the drastic environmental, economic and cultural changes which have occurred along this trade route.

While small businesses along the highway prosper, the traditional relationship between the people and their natural environment is being lost. Forests are felled and the wood sold for quick money which eventually ends up, not in the pockets of local workers, but in the bank accounts of urban contractors.

The relatively recent collapse of the Feudal regime of the Mirs in 1972 also meant that there was no longer any enforcement of the law on productive land in the valleys of the villages.

The film makes clear the point that people from various ethnic and religious backgrounds must learn to adapt to the demands of modern life, brought so abruptly into their valley by the highway, or face continued environmental degradation and eventual poverty.